What is claimed is:

1. Apparatus for conducting electrophoresis therein, the apparatus comprising:

a substantially closed electrophoresis chamber;

an electrophoresis gel located within said electrophoresis chamber; and

electrolyte solution in contact with said gel,

wherein said electrolyte solution has high buffer capacity and low conductivity properties.

2. Apparatus as in claim 1, wherein said electrolyte solution and said electrophoresis gel have a similar concentration of ions.

3. Apparatus as in claim 1, wherein said electrolyte solution comprises an ion reservoir.

4. Apparatus as in claim 1, wherein said electrolyte solution comprises an amine and a zwitter ion.

5. Apparatus as in claim 4, wherein said amine is selected from the group consisting of Bis-Tris, tris and amino methyl propanol.

6. Apparatus as in claim 4, wherein said zwitter ion is selected from the group consisting of tricine, bicine, glycilglycine, TAPS, EPPS, glycine and proline.

7. Apparatus as in claim 4, wherein the pK of said amine is lower than that of said zwitter ion by 0.9-2 pH units.

8. Apparatus as in claim 1, wherein said electrolyte solution comprises a weak acid and a zwitter ion.

9. Apparatus as in claim 1, wherein said electrophoresis gel is agarose.

10. Apparatus as in claim 1, wherein said electrophoresis gel is polyacrylamide.

11. Apparatus as in claim 2 wherein said ion reservoir is in a semi-solid form.

12. Apparatus as in claim 1, further comprising an anode and a cathode.

13. Apparatus as in claim 12, wherein said anode is made of an electrochemically ionizable metal.

14. Apparatus as in claim 13, wherein said electrochemically ionizable metal is copper.

15. Apparatus as in claim 13, wherein said electrochemically ionizable metal comprises metal ions, wherein the migration of said metal ions is inhibited by components of said electrolyte solution.

16. Apparatus as in claim 1, further comprising ion exchange matrices at at least one end of said electrophoresis gel.

17. Apparatus for conducting electrophoresis therein, the apparatus comprising:

an electrophoresis chamber;

an electrophoresis gel comprising a running zone and at least one ion reservoir zone, said gel located within said electrophoresis chamber; and

electrolyte solution in contact with said electrophoresis gel,

wherein said electrolyte solution has high capacity and low conductivity properties, and the volume of said at least one ion reservoir zone is less than twice the volume of said running zone of said electrophoresis gel.

18. Apparatus as in claim 17, wherein said electrolyte solution and said electrophoresis gel have a similar concentration of ions.

19. Apparatus as in claim 17, wherein said electrolyte solution comprises an amine and a zwitter ion.

20. Apparatus as in claim 19, wherein said amine is selected from the group consisting of Bis-Tris, tris and amino methyl propanol.

21. Apparatus as in claim 19, wherein said zwitter ion is selected from the group consisting of tricine, bicine, glycilglycine, TAPS, EPPS, glycine and proline.

22. Apparatus as in claim 19, wherein the pK of said amine is lower than that of said zwitter ion by 0.9-2 pH units.

23. Apparatus as in claim 17, wherein said electrolyte solution comprises a weak acid and a zwitter ion.

24. Apparatus as in claim 17, wherein said electrophoresis gel is agarose.

25. Apparatus as in claim 17, wherein said electrophoresis gel is polyacrylamide.

26. Apparatus as in claim 17 wherein said ion reservoir zone is in a semi-solid form.

27. Apparatus as in claim 17 wherein said ion reservoir zone is in liquid form.

28. Apparatus as in claim 17, further comprising an anode and a cathode.

29. Apparatus as in claim 28, wherein said anode is made of an ionizable metal.

30. Apparatus as in claim 29, wherein said electrochemically ionizable metal is copper.

31. Apparatus as in claim 28, wherein said electrochemically ionizable metal comprises metal ions, wherein the migration of the metal ions is inhibited by components of said electrolyte solution.

32. Apparatus as in claim 17, further comprising an ion exchange matrix adjacent to said ion reservoir zone.

33. Apparatus for conducting electrophoresis, said apparatus comprising:

a running gel;

an anode and a cathode at two ends of said gel; and

electrolyte solution in contact with said gel,

wherein said anode is made of an electrochemically ionizable metal and wherein said electrolyte solution is of a composition such that migration of ions generated by said anode is inhibited.

34. Apparatus as in claim 33, wherein said migration of ions is limited to an area adjacent to said anode.

35. Apparatus as in claim 33, wherein said electrochemically ionizable metal is copper.

36. Apparatus as in claim 33, wherein said electrochemically ionizable metal comprises metal ions, wherein the migration of said metal ions is inhibited by components of said electrolyte solution.

37. Apparatus as in claim 33, wherein said anode is comprised of copper, and said ions are copper ions.

38. Apparatus as in claim 33, wherein said electrolyte solution comprises an amine and a zwitter ion.

39. Apparatus as in claim 38, wherein said amine is selected from the group consisting of Bis-Tris, tris and amino methyl propanol.

40. Apparatus as in claim 38, wherein said zwitter ion is selected from the group consisting of tricine, bicine, glycilglycine, glycine and proline.

41. Apparatus as in claim 38, wherein the pK of said amine is lower than that of said zwitter ion by 0.9-2 pH units.

42. Apparatus as in claim 33, wherein said electrolyte solution comprises a weak acid and a zwitter ion.

43. Apparatus as in claim 33, wherein said running gel is agarose.

44. Apparatus as in claim 33, wherein said running gel is polyacrylamide.

45. Apparatus as in claim 33 wherein said electrolyte solution comprises an ion reservoir.

46. Apparatus as in claim 45 wherein said ion reservoir is in a semi-solid form.

47. Apparatus as in claim 45 wherein said ion reservoir is in liquid form.

48. Apparatus as in claim 33, further comprising ion exchange matrices at at least one end of said running gel, in contact with said anode and said cathode.

49. Apparatus for conducting electrophoresis, said apparatus comprising:

a substantially closed electrophoresis chamber;

an electrophoresis gel comprising a running zone and an ion reservoir zone, said electrophoresis gel located within said electrophoresis chamber; and

an anode and a cathode at two ends of said gel; and

electrolyte solution in contact with said electrophoresis gel at least on one of said two ends,

wherein said anode is made of an electrochemically ionizable metal, wherein said electrolyte solution is of a composition such that migration of ions generated by said anode is inhibited,

wherein said electrolyte solution has high capacity and low conductivity properties, and

wherein the volume of said ion reservoir zone is less than twice the volume of said running zone of said electrophoresis gel.

50. Apparatus as in claim 49, wherein said electrochemically ionizable metal is copper.

51. Apparatus as in claim 49, wherein said electrolyte solution and said electrophoresis gel have a similar concentration of ions.

52. Apparatus as in claim 49, wherein said electrolyte solution comprises an amine and a Zwitter ion.

53. Apparatus as in claim 52, wherein said amine is selected from the group consisting of Bis-Tris, tris and amino methyl propanol.

54. Apparatus as in claim 52, wherein said Zwitter ion is selected from the group consisting of tricine, bicine, glycilglycine, glycine and proline.

55. Apparatus as in claim 52, wherein the pK of said amine is lower than that of said Zwitter ion by 0.9-2 pH units.

56. Apparatus as in claim 49, wherein said electrolyte solution comprises a weak acid and a Zwitter ion.

57. Apparatus as in claim 49, wherein said electrophoresis gel is agarose.

58. Apparatus as in claim 49, wherein said electrophoresis gel is polyacrylamide.

59. Apparatus as in claim 49 further comprising ion exchange matrices at at least one end of said electrophoresis gel.

60. Apparatus as in claim 49 wherein said ion reservoir zone is in a semi-solid form.

61. Apparatus as in claim 49 wherein said ion reservoir is in liquid form.

62. A system for conducting electrophoresis, the system comprising:

an electrical power source;

a cassette for conducting an electrophoresis therein and having conductive elements therein, said cassette comprising:

an electrophoresis gel; and

electrolyte solution in contact with said gel, wherein said electrolyte solution has high capacity and low conductivity properties; and

a support for supporting said cassette and for connecting said electrical power source to said conductive elements of said cassette.

63. A system according to claim 62 further comprising a light source, thereby enabling visualization of said electrophoresis while said cassette is in situ.

64. A system according to claim 62 wherein said light source is of variable wavelengths.

65. A system according to claim 62, wherein said light source is a UV light source, and said cassette comprises UV sensitive material capable of interacting with molecules undergoing electrophoresis and of emitting light.

66. A system according to claim 62 further comprising a colorimetric dye capable of interacting with molecules undergoing electrophoresis, thereby enabling to conduct said electrophoresis and to visualize it while said cassette is in situ.

67. A system according to claim 62 further comprising camera means for documenting the results of said electrophoresis.

68. A system according to claim 62 wherein said support is configured to connect to one or more gels simultaneously.

69. A method for conducting electrophoresis in a closed cassette, comprising the steps of:

introducing at least one test sample into a body of gel comprising a running zone;

applying an electrical field to said body of gel; and

driving an electrophoresis by providing ions for maintaining an electric field required for electrophoresis by electrolyte solution having high capacity and low conductivity properties, wherein said electrolyte solution comprises an ion reservoir zone with a volume less than twice than a volume of said running zone.

70. A method for reducing the volume of buffer used in electrophoresis, comprising the steps of:

providing an electrolyte solution of high buffer capacity and low conductivity;

incorporating said electrolyte solution in an electrophoresis gel at a specified pH; and

applying a voltage to said electrophoresis gel, thereby eliciting chemical reactions so as to equilibrate said specified pH.

71. A method for inhibiting migration of an ion through an electrophoresis gel, comprising the steps of:

providing an electrochemically ionizable anode in an electrophoresis gel;

providing an electrolyte solution within said electrophoresis gel and in contact with said anode;

applying a voltage to said electrophoresis gel so as to generate an electrochemical reaction releasing ions from said anode; and

inhibiting migration of said released ions by a chemical reaction between said released ions and components of said electrolyte solution.

72. A method as in claim 71 wherein said anode is comprised of copper and said ions are copper ions.